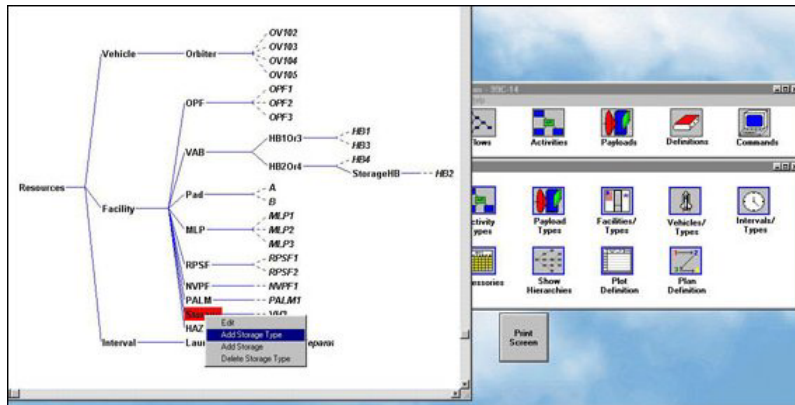


# FACT SHEET

## California Company Commercializes Space Shuttle AI Software



The San Mateo, California company Stottler Henke Associates, Inc. (SHA) is commercializing an artificial intelligence (AI)-based software system developed to help NASA with complex Space Shuttle scheduling decisions.

The Automatic Scheduling System, known as the Automated Manifest Planner (AMP) at Kennedy Space Center, was designed using AI techniques, allowing expert Shuttle schedulers to input their knowledge to create a working automatic scheduling system. Company president Richard Stottler said his firm is marketing this software tool and other related products and services to industries involved with many resources, activities, and constraints, particularly when it is desirable to plan and project changes for many cycles or years ahead.

This type of scheduling is common in vehicle assembly plants, batch processing plants, semiconductor manufacturing, printing and textiles, batch processing, surface and underground mining operations, and maintenance shops, where scheduling the use of different pieces of equipment that work together impacts production rates and costs. For most of SHA's commercial sales, the company obtains a service contract to customize AMP to a specific domain and then issues the customer a user license, Stottler explained.

NASA/KSC is using the AMP product to develop optimal manifest schedules, which support ongoing Shuttle program efforts to reduce labor costs. Current commercial sales total \$400,000, exceeding NASA's SBIR investment, and private investment is at \$50,000.

AMP can be readily adapted by end-users for a variety of domains. A key advantage of the tool is that it enables advanced use of rules of thumb (heuristics) developed by expert schedulers to be used to automatically schedule activities based on resource limitations and a wide range of other constraints. It also provides a constraint authoring system for adding other constraints to the scheduling process. The product is extremely flexible and user-friendly, and can plan orders of magnitude faster than existing tools. One user recently reported that he had to perform over 100 planning studies in a year, which would have been impossible without AMP.

Other NASA centers are also benefiting from this technology. With an increased workload for the planners to schedule the International Space Station assembly and operations, NASA needed more automation in their scheduling process. SHAI developed the Intelligent Flight Activity Planner (IFAP) to address this need. IFAP provides both a planning and scheduling component. In the weeks prior to the actual time of activity performance, NASA planners use the high-level planning component to lay out tentative plans that assign flight activities to specific days.

Also, an SBIR contract with Johnson Space Center led to the development of an intelligent fault diagnosis and recovery planning system designed to help astronauts minimize the need for ground support during long-duration missions. The new software will enable astronauts to diagnosis problems and effect repairs in their advanced life support systems without assistance from engineers on the ground.

The AMP was developed under a Phase II Small Business Innovation Research (SBIR) contract involving SHAI and NASA at Kennedy Space Center from 1992 to 1994. It was developed in response to NASA's need to automate the scheduling decision-making associated with maintaining the long-term Shuttle processing schedule. NASA's Mission Planning Office used AMP to perform scheduling studies and maintain the schedule known as the "mission manifest."

In 1994, the Mission Planning Office was dissolved and the long-term planning component was transferred to United Space Alliance (USA), the primary Shuttle contractor at KSC. The system allowed personnel unfamiliar with long-term scheduling to maintain it without years of previously required training. AMP has now been used on a daily basis for 7 years to maintain manifests, perform advanced "what if" studies, and produce manifest reports for all NASA field centers. USA also adapted AMP to automatically schedule the detailed, short- and long-term External Tank and Solid Rocket Booster (ET/SRB) and orbiter processing schedules, vastly improving the previous manual scheduling process.

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